

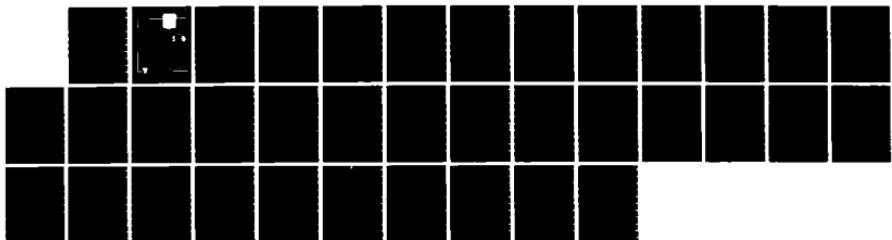
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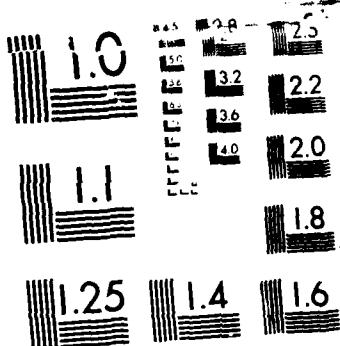
INDUSTRIAL MOBILIZATION AND THE NATIONAL DEFENSE -- HOW 1/1
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INDUSTRIAL MOBILIZATION AND THE NATIONAL DEFENSE
HOW READY ARE WE?

BY

LIEUTENANT COLONEL M. T. TOMLINSON, JR.

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dependent on foreign sources of supply for critical components; productivity growth rates for U.S. defense manufacturing are among the lowest in the free world; and there are no current programs to address the efficient use of industrial resources. The essay closes with the following recommendations for improvement in defense industrial mobilization: A shift to multiyear funding for procurement contracts; initiation of multiyear authorizations and appropriations; creation of new incentives for capital investment; multiple sourcing of all critical parts; competition during production of large defense contracts; broadening of the research and development base; less dependence on foreign sources; and significant adjustments to the structure of the defense industry.

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USAWC MILITARY STUDIES PROGRAM PAPER

INDUSTRIAL MOBILIZATION AND THE NATIONAL DEFENSE
HOW READY ARE WE?

INDIVIDUAL ESSAY

by

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26 April 1986

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ABSTRACT

AUTHOR: M. T. Tomlinson, Jr., LTC, OrdC

TITLE: Industrial Mobilization and the National Defense - How Ready Are We?

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The basic question addressed is whether the United States defense industrial base could mobilize in a timely manner in the event of a major conventional conflict with the Soviet Union. The conclusion is that it could not. After tracing the "episodic" history of America's defense industrial base, it is determined the following critical issues exist in 1986: The current industrial base is unbalanced and incapable of surging production rates in a timely manner; the base has become increasingly dependent on foreign sources of supply for critical components; productivity growth rates for US defense manufacturing are among the lowest in the free world; and, there are no current programs to address the efficient use of industrial resources. The essay closes with the following recommendations for improvement in defense industrial mobilization: A shift to multiyear funding for procurement contracts; initiation of multiyear authorizations and appropriations; creation of new incentives for capital investment; multiple sourcing of all critical parts; competition during production of large defense contracts; broadening of the research and development base; less dependence on foreign sources; and, significant adjustments to the structure of the defense industry.

The scenario is a simple one. It is the late 1980's and, as a result of increasing tensions between the Soviet Union and the United States, conventional hostilities are imminent. America finds itself in a position of numerical inferiority with respect to personnel and materiel, but has a proud tradition of overcoming both obstacles in previous conflicts. The resulting question is straightforward: Will the United States be able to mobilize its personnel and defense industrial base in order to provide the people and equipment to wage the major war it is about to face?

The purpose of this essay is to examine America's ability to mobilize its defense industrial base. No attempt will be made to discuss the personnel mobilization issue, even though it is necessarily intertwined with our industrial capability.

The methodology for this discussion will be simple and direct. The essay will initially examine the history of our military industrial mobilization capacity, follow with an analysis of its existing state and the problems associated therewith, and close with conclusions and recommendations for improvement.

At the outset, a definition of this base is in order:

The term "defense industrial base" refers to the business firms and government facilities that produce the weapons and allied services purchased by the Department of Defense. The business firms that make up this base include large corporations and small family-owned companies. Some manufacture both

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defense and nondefense products. Their activities range from assembling major weapons systems (tanks, aircraft, missiles) to supplying small parts and to machining already manufactured parts.¹

The United States General Accounting Office definition outlined above will serve as the basis for this essay.

Historical Overview

It is historically well documented that the United States military establishment has enjoyed a "warm-cold" relationship with its defense industrial base. As a result of this relationship, the dominant feature of America's arms procurement up to the Vietnam conflict has been its cyclic or "episodic" quality.² Typically, the start of any major conflict found the United States unprepared, with American industry engaged primarily in the manufacture of civilian goods. During the engagement, there has always been a strenuous effort to increase production of war-related materiel, culminating in sudden and significant cutbacks in defense spending and production at the end of hostilities. Name the conflict: Revolutionary War, Civil War, World War I, World War II, Korea or Vietnam, the cycle has been remarkably similar. In all cases, production scaled up slowly until it reached its maximum output -- thereby turning the tide in most cases -- only to be shut off suddenly, like a water spigot, to lapse back to its unprepared pre-war condition.

World War II represented a watershed in the history of the defense industry as the war buildup resulted in defense spending escalating from 2% to 40% of the gross national product (GNP), just prior to the cessation of hostilities.³ Literally hundreds of firms were mobilized to produce war materiel; better policies were in effect to control distribution; and better arrangements were in place for performing domestic research and development (R&D).

By the end of World War II, the United States had come a long way in terms of industrial mobilization. However, certain features of America's mobilization efforts began to give it a unique and disturbing identity. Part of that identity was the fact "...the United States (was) the only major nation that (did) not treat its defense industrial base as a critical national resource."⁴

Historically we have been consistent -- consistently "episodic." Jacques Gansler, a former Deputy Assistant Secretary of Defense for Material Acquisition and noted author on industrial mobilization, writes to the effect that, over the past 200 years, the following eight features characterize America's industrial mobilization capability:⁵

1. The Extreme Cyclic Nature of Defense Procurements -- Since 1776 the on-again, off-again nature of defense procurements has aborted any attempt at industrial mobilization stability. The defense industrial base was dismembered at the end of each crisis with all the inherent inefficiencies associated therewith. During World War I, the United States shipped over two million men to Europe, but they fought mostly with French and British weapons. Only 145 field guns and sixteen tanks were shipped from America to France before the Armistice.⁶ When the war ended, industries which had been converted from civilian to military production either converted back to civilian manufacture or went out of business. World War II followed the same pattern, except we fought primarily with our own equipment.

2. Lack of Structural Planning -- From the inception of the defense industrial base until the present, its evolution and status at any point (i.e., the mix between government-owned and privately-owned plants) has been based purely on chance. In the early years, private industry showed no desire

to develop new military technology. New military developments stemmed primarily from the federal naval shipyards or War Department armories. Historically, military technology mirrored civilian technological developments. (It is interesting to note, shipyards and armories did provide early breakthroughs in machine tool advances prior to large cutbacks in defense budgets and a catchup by the private sector. In summary, no logical structural plan has ever been developed for our defense industrial base.

3. Inadequacy of Industrial Preparedness Planning -- A major problem! The best recent example of this lack of preparedness planning is the 1974 Arab-Isreali War. The United States made an attempt to dramatically increase its tank production base, in order to supply an urgently needed weapon to the Isrealis. However, despite the fact the majority of production rampup problems could have been overcome, America did not have enough hull, turret and gun tube castings on the shelf to be of any benefit in the short-term. There was only one government arsenal capable of producing these castings in the United States. Unfortunately, no one had planned ahead!

4. Lack of Actual Industrial Readiness -- Traditionally, the United States has been capable of mobilizing personnel more rapidly than it could equip them. As technology has improved over the last 200 years, this problem has become more and more acute. America can no longer produce its critical military weapons (aircraft, ships, tanks, etc.) at high volume in a short period of time. The highly advanced technological state of new equipment prohibits expeditious startup and production.

5. The Importance of Technology and Research in Defense --

Throughout history military crises have led to technological advances which, in turn, created new civilian industries. An excellent example is Eli Whitney's government musket contract for the year 1798, which led to interchangeable parts production. History illustrates that America's defense industry has been driven by technology, which has resulted in extremely heavy emphasis on R&D funding, often at the expense of production. Greater emphasis has routinely been placed on systems under development rather than those already deployed. A good example of this is the development of numerous aircraft prototypes during the 1920's and 1930's. Private firms literally developed hundreds of aircraft designs, none of which were procured in quantity. However, military support was important to the very survival of the aircraft industry during the depression.⁷

6. Vast Differences Among Industries that Comprise the Industrial Base --

Due to historical evolutions, the various military sectors such as shipbuilding, aircraft construction and munitions manufacturing are significantly different with respect to the manner in which they do business. This causes problems at all ends of the spectrum, from research and development to production. Government acquisition personnel must be capable of deciphering the internal dynamics of each of these different industries. More often than not, administrative requirements are levied on all contractors without regard to their product -- the same reports, specifications, inspections, etc., are required of the aircraft industry, as well as the entrenching tool business. While oversimplified, this analogy illustrates the extreme ranges of technology utilized by the Department of Defense and the voluminous amount of paperwork required.

7. High Concentration Within Few Industries -- During World War II, over \$26 billion was invested in new manufacturing plants and equipment. Two-thirds of this was invested by the US Government and sunk into existing private facilities, which were sold after the war. Seventy percent of these facilities were purchased by some 250 of the nation's largest firms.⁸ Today defense procurement is concentrated in a small manufacturing sector, which has caused innumerable start-up, contractual and competitive problems. This critical issue is discussed in greater detail at pages 10 and 11 of this essay.

8. Heavy Dependence on International Assistance -- The United States has become increasingly dependent on shipments from foreign countries for critical components and materials for its military equipment. America's dependence on Japan is the best example and will be examined in detail on pages 13 and 14. However, the problems inherent with international dependence are obvious, even to the casual observer of the defense business. US dependence on foreign machine tooling is a perfect example of this trend and has played a major role in America's lack of preparedness since 1965.

Each of the aforementioned factors have historically impacted on America's defense capabilities and its ability to mobilize the industrial base. While Gansler's list is not all-inclusive, it highlights the major concerns and serves as the basis for further analysis.

In summary, America's defense industrial base traditionally has been neglected in peacetime and stoked to a red hot glow during conflict. The United States has successfully defended itself over the years with this "reactive" strategy, but the times and circumstances are certainly changing. With the aforementioned history in mind, I will now examine the current state

of America's defense industrial mobilization health. Where is it today?

What are the most significant problems?

Current Industrial Mobilization Condition

First it is important to understand America's national security strategy. Since 1950 the United States has essentially adhered to a European, short war scenario which entails little or no advance warning prior to the onset of hostilities. This strategy was developed during a period when America enjoyed a clear strategic and tactical superiority and an independent economy.⁹ However, since 1950 there has been a massive shift in superpower balance as the Soviet Union has exerted its emerging dominance, while concurrently increasing the capacity of its industrial base.

Since 1980 the estimated cost of the total Soviet military program has been 35% more than the comparably defined US outlay. Furthermore, the cost of Soviet weapons procurement has been 50% higher. The Soviet military receives an estimated 15-17% of the USSR's gross national product, and a significant amount of their national resources are dedicated exclusively to national defense.¹⁰ If the United States devoted the same percentage of its GNP to the military as the Soviets, the 1987 defense budget request would be in the vicinity of \$700 billion rather than the current \$311 billion.¹¹ As succinctly stated by General James P. Mullins, commander of the Air Force Logistics Command:

The Soviets view their defense industry for exactly what it is: a high priority part of their military capability. And they treat it as such, right down to the elements of command and control, by tightly integrating their industrial base with national defense strategy. The primary effect of this approach, of course, is a weapons producing system that the

military can, with great confidence, rely on in time of war. Its efficiency is evidenced by the impressive growth we've seen in the Soviet arsenal and its proven ability to turn out large quantities of weapons quickly.¹²

In the 1980's, the Soviet Union is emerging as the single largest producer of arms in the world, and their industrial base is expanding accordingly. Western automated production methods have been integrated into their processes, and their technology is now capable of producing some of the world's most sophisticated weaponry.¹³ Additionally, the Soviet Union's industrial base is extremely active and remains on a near-war footing at all times. Since they have also chosen a philosophy of less-advanced technology with respect to many of their conventional weapons and equipment, they are capable of producing large quantities of less-complex weapons in a short period of time.

In contrast to the Soviet Union, the United States dedicates far less of its budget to defense in general and to the industrial base in particular. Table 1 illustrates defense spending by the United States as a percentage of GNP since 1950 and vividly depicts a downward trend.

Also in contrast to the Soviet Union, America's industrial base consists of a mixture of privately-owned and government-owned facilities. US Public Law mandates maximum reliance on the private sector for the provision of goods and services. Government-owned industries consist primarily of manufacturing capabilities, which have a direct wartime correlation. Examples include artillery tubes, ammunition, etc., which could not be efficiently produced and maintained by civilian industry. The existing government-owned industrial base consists of only 72 production plants (14 of which are in an inactive status) and 43 maintenance facilities. Only one government-owned

DEPARTMENT OF DEFENSE BUDGET

**Total, and Selected Components, and as a Percentage of Federal
Budget and Gross National Product, Selected Years**

Fiscal Year	Total Obligational Authority (\$ Million)			Budget as Percentage of	
	Total	Procurement	RDT&E	Federal Budget	GNP
1950	14,337	4,176	553	27.4	4.4
1955	33,790	8,917	2,621	51.3	9.2
1960	40,257	11,137	5,476	45.0	8.3
1965	49,561	14,112	6,433	38.7	7.0
1968	74,965	22,528	7,263	43.2	9.3
1970	75,517	19,161	7,399	39.2	8.0
1972	76,502	18,526	7,584	32.4	6.7
1975	86,176	17,320	8,632	26.0	5.8
1978	116,494	30,346	11,474	22.9	5.0
1980	139,343	35,792	13,517	22.6	5.1

Source: DoD, OASD (Comptroller, National Defense Budget Estimates for
Fiscal Year 1981, Washington, DC, pages 69-71, 100.

TABLE I

plant has been constructed since 1965.¹⁵ There can be no debate as to the Soviet Union's existing industrial base being superior to that of America's -- it is not only superior, but larger and warmer.

Today, America's industrial base is made-up of 25,000 - 30,000 prime contractors and approximately 50,000 contractors at the lower tiers.¹⁶ These are a mixture of pure defense contractors and those manufacturers who produce both defense and civilian commodities. However, of the 25,000 - 30,000 prime contractors, ten received 30% of all prime Department of Defense contracts in 1980.¹⁷ These "top ten" firms are listed at Table 2. This highlights a problem that has existed since World War II with respect to America's demobilization strategy -- too few firms control the destiny of the defense industrial base.

Critics of the American military are quick to point out that the US defense industry is not defined in the usual manner; that is, by its product. Rather, it consists of a number of firms from different industries. Using the previously-mentioned "top ten" firms as an example, the makeup of the typical US defense contractor is the single most determinant characteristic of the defense industry. Analyst Judith Reppy describes five of the most dominant features of the US defense market. All of America's "top ten" contractors:¹⁸

1. Emphasize high technology with performance of new weapons getting more attention than cost;
2. Let the government accept most of the risk associated with developing new technology through direct funding of R&D;
3. Utilize elaborate accounting procedures and contractual arrangements for monitoring progress, results and costs;
4. Utilize, by necessity, elaborate US and DoD budget processes; and,
5. Have a close relationship and continual exchange of people and

LEADING DEPARTMENT OF DEFENSE PRIME CONTRACTORS, FY 1980

Company	Principle Defense Products	1980 Rank on List of 100 Prime Contractors	1978 DoD Prime Contract as % of Sales
General Dynamics	Aircraft, Missiles Nuclear Submarines	1	47.3
McDonnell Douglas	Aircraft, Missiles	2	72.6
United Technologies	Aircraft Engines Helicopters	3	28.6
Boeing	AWACS, Missiles	4	39.3
General Electric	Nuclear Reactors for Submarines, Aircraft Engines	5	8.7
Lockheed	Missiles, Aircraft	6	46.6
Hughes Aircraft	Missiles, Radar	7	60.7
Raytheon	Missiles, Electronics	8	36.9
Tenneco (Newport News)	Ships	9	10.0
Grumman	Aircraft	10	92.0

Sources: DoD, 100 Companies Receiving the Largest Dollar Volume of Prime Contract Awards, Washington, DC.

"The Weapons Acquisition Process," Boston: Harvard University Press, 1981, pages 602 - 611.

DoD, Program Managers Newsletter, May-June 1978, page 25.

TABLE 2

information between contractors and the Department of Defense.

I generally agree with Reppy's assessment. This is not to imply all of the aforementioned factors have negative impacts on the industrial base, just that it differs from any of the major industrialized nations and their approach to defense. As mentioned previously "...the United States is the only major nation that does not treat its defense industrial base as a critical natural resource."²⁰ The nature of America's government-industry relationship, as described by Reppy, clearly highlights some of the inherent problems which now exist.

Critical Defense Industrial Mobilization Concerns

I would now like to examine the typical problems and concerns facing the US industrial base in 1986. For purposes of discussion I have selected a 1985 General Accounting Office study which I believe best describes the overall situation:²¹

1. The Current Defense Industrial Base is Unbalanced -- While excess production capacity exists at the prime contractor level, there are serious deficiencies at the subcontractor and supplier levels. Specifically, the number of parts suppliers is declining at an alarming rate. Low profit orders, on a one year basis, are running off subcontractors -- they simply cannot plan ahead. Excessive paperwork, combined with uneconomical orders, further exacerbates this problem and makes civilian orders more preferable to those of defense. Unfortunately many of these subcontractors are the sole source for numerous critical defense items.²²

2. The Current Industrial Base is Incapable of Surging Production Rates in a Timely Fashion -- As discussed earlier, high technology and long leadtime contracts virtually eliminate America's ability to quickly produce

critical defense items. Although the United States has begun to stockpile strategic goods and raw materials the cost has become astronomical.

As stated by a defense observer:

The deterioration of the US defense posture over the past decade has been paralleled by a deterioration in the capacity of the national economy to sustain an adequate defense. Today the nation is seriously deficient in the economic resources needed to cope with the security environment of the 1980's.²³

3. The United States Has Become Increasingly Dependent on Foreign Sources of Supply -- In 1983 America paid approximately \$50 billion a year for procurement of military equipment, and many of the components were imported from overseas. It is conservatively estimated some 50-60% of the goods, technology, production processes, or equipment needed for defense mobilization would have to be obtained from foreign sources in the event of future hostilities.²⁴

An examination of the machine tool industry is the best example of this foreign dependence. The importance of machine tooling to America's national defense cannot be overstated; any significant increase in armament production would call for a corresponding increase in machine tooling. In 1985 foreign markets had captured over 37% of the worldwide machine tool market from the United States.²⁵ Furthermore, over 50% of the computer-controlled machining centers now sold in America are imported from Japan.²⁶

Not only is America importing machine tooling, but the capability of the existing base is in poor condition. A 1980 Defense Science Board study reports:

The (US) government machine tool base contains about 115,000 tools of which 8,000 are less than ten years old....the condition of those tools in storage is deteriorating and some are useless....a representative of the National Machine Tool Builder's Association stated that the government inventory is worthless and should be disposed of.²⁷

The challenges facing US industry in today's foreign market are overwhelming, and the United States simply cannot afford to lose basic capabilities such as machine tooling. We vitally need a strong and competitive manufacturing sector in order to compete and remain strategically prepared in today's world.

America's manufacturing dependence on Japan borders on being a major national security risk. Table 3 indicates Japan's dependence on foreign resources which it requires to maintain its existing manufacturing capabilities.²⁸ It logically follows that these same resources will be required to allow Japan to continue exporting its finished products such as machine tools, etc., to its foreign customers including the US. The extent of Japan's dependence is staggering! In essence, the US has been placed in a position of having to defend not only its own logistics lines of communication, but those of Japan. Since it is 99% dependent on import resources to support its manufacturing base, Japan cannot survive economically without outside protection during conflict.

4. Productivity Growth Rates for the United States Manufacturing Sector Are Among the Lowest in the Free World. Productivity Growth for the Defense Sector is Lower than the Manufacturing Sector -- Many economists make a valid case for productivity growth being the most significant problem in the defense industrial mobilization arena. Most observers agree America's productivity is declining at an alarming rate, and the economic facts bear them out. The "Harvard Business Review" states:

In 1950 the United States accounted for about 6% of the world's population, 40% of its gross national product, and 20% of world trade. By 1980 we had 5% of the world's population, but only 21.5% of its GNP and 11% of its trade.²⁹

BASIC MATERIALS FOR JAPANESE STEEL PRODUCTION

	Import Dependence	Consumed By Steel Industry	Share of World Trade
Iron Ore	99.6%	99.0%	37.8%
Energy	87.0	15.1	13.4
Crude Oil	99.8	-	14.1
Coal	79.2	-	26.8
Natural Gas	88.7	-	10.4
Hydro/Nuclear	-	-	-
Coking Coal	92.7	76.0	26.3
Manganese	99.0	91.0	30.9
Other Alloys			
Chromium	93.5	72.0	26.1
Molybdenum	99.5	71.0	21.6
Nickel	93.0	46.0	30.5
Tungsten	69.4	7.0	11.2

Source: "Mobilization and the National Defense," Washington, DC,
National Defense University Press, 1985, page 103.

TABLE 3

Global competition in heavy industries such as shipbuilding, steel and automobiles has caused US productivity to fall to new depths. Employment in the automobile and steel industries will account for only 8% of the workforce in 1990, compared to 20% in 1984. Overall the manufacturing sector of the US economy will contribute less than 20% to the national income by 1990, contrasted with 30% in the late 1960's.³⁰ International competition is drastically changing America's defense industrial base. Although the US gross national product remains the largest in the world, on a per capita basis, it was only ninth of all the Organization of Economic Cooperation and Development countries in 1980.³¹

Table 4 indicates 1983 bilateral trade balances in manufacturing goods for the United States, Japan and Europe. It is estimated the US will be -59% by 1988 while Japan and Europe will have surged to +168% and +187% respectively.

A comparison of manufacturing trade balances and productivity growth against world competitors indicates America's frustration in this area and an inability to halt the phenomena. Between 1977 and 1981 US manufacturing capability increased by 4.5%. In contrast, Japan's increased by 29.4% and Germany's by 12.8%. The downward trend in American productivity is irrefutable.³² As noted by Dr. M. Lewis Branscomb, Vice President and Chief Scientist of IBM Corporation: "Our productivity determines nothing less than the security of our nation, the standard of living of our people and our legacy to future generations."³³

5. There Are No Current Programs to Address the Efficient Use of Industrial Resources to Support the Peacetime Defense Program. There Are No Comprehensive Plans to Address Industrial Base Preparedness Issues --

BILATERAL TRADE BALANCES IN MANUFACTURED GOODS

		<u>US</u>	<u>Japan</u>	<u>SE Asia</u>	<u>Europe</u>	<u>Other</u>	<u>Total</u>
United States	1980	-	-21	5	5	40	19
	1984	-	-42	-21	-16	29	-50
	1988	-	-52	-30	-20	45	-59
Japan	1980	21	-	11	15	50	97
	1984	42	-	13	16	57	128
	1988	54	-	17	21	76	168
Europe	1980	-5	-15	16	-	109	105
	1984	16	-16	17	-	111	128
	1988	20	-21	25	-	163	187

Source: Wharton Econometric Forecasting Association Roundtable
 Washington, DC, 14 December 1983.

TABLE 4

While the GAO found improvements in this area between 1980 and 1985 by the Department of Defense, this critical industrial resource and preparedness issue remains as one of the biggest obstacles facing industrial mobilization growth. Succinctly, the federal government has not dedicated the personnel and financial resources toward developing a comprehensive, politically acceptable program in these vital areas.

In addition to the problems highlighted by the General Accounting Office, the Defense Science Board published their study on industrial responsiveness in 1980. They focused on the following concerns:³⁴

1. Productivity in the Defense Sector Has Been Lagging -- This is a corollary to item 4, page 14 of this essay. This lack of productivity can be attributed in large measure to low levels of capital investment compared to manufacturing in general. Research and development has become a particular investment problem. US spending on basic research as a percent of GNP has only been two-thirds that of Japan and West Germany.³⁵ Traditionally America has depended heavily on technology to maintain its industrial advantage, but we do not appear to be making current investments at a sufficient rate to insure future success.

2. The Defense Industry Has Little or No Capability to Surge Production in the Short-Term -- Aside from the US inability to surge tank production in 1974, the best example of this lack of responsiveness in ramp-up capability is the current munitions industry. Due to many of the previously stated reasons (i.e., low capital investment, lack of machine tool availability, long leadtime contracts, etc.), the Defense Science Board concludes that the one industry generally thought of as having the best surge capability would still require seven to eighteen months to reach required

delivery rates at the onset of conventional hostilities. And this is an industry which has numerous plants operational and semi-operational.³⁶

Long leadtime contracts are the most significant problem in the munitions business.

3. Currently, and in the Foreseeable Future, There Will Be a Serious Shortage of Engineers, Technicians and Skilled Blue-Collar Workers.

Current Training and Education Programs Are Not Solving the Problem -- In 1985 there was a shortage of 240,000 machinists throughout US industry, 10,000 of which were required in the defense industry alone. The Bureau of Labor Statistics estimates during the period 1985 to 1990 there will be 22,000 critical openings for machinists in the United States, but apprenticeship programs provide only 2,800 per year.³⁷

The shortage of engineering and scientific graduates in the US is well documented. In 1981 the maximum capacity of our educational institutions was 50,000 engineers a year, far below US requirements. Japan graduates more mechanical engineers per year than the United States with a population one-half our size. Only 5% of America's college degrees are in engineering compared to 40% in Japan. Additionally, foreign students comprise up to 40% of the total enrollment for engineering at the masters level at US universities and 47% of the doctoral candidates.³⁸ To exacerbate the situation, blue collar employment has decreased significantly over the last 25 years. While manufacturing represented 26% of blue collar employment in 1962, it was down to 20% by 1985. The "service" sector of the US economy has absorbed the difference.³⁹ In short, we have more hamburger flippers than machinists, more key punch operators than assembly line workers, as the US evolves into a service-oriented economy; an economy with disastrous implications for our national defense capabilities.

The aforementioned concerns of the General Accounting Office and the Defense Science Board represent a small segment of the problems with respect to defense industrial mobilization. However they do highlight the most significant challenges of our current condition.

Conclusions

My basic conclusion is that the United States possesses little or no industrial mobilization potential, and drastic federal action is necessary to preclude a complete catastrophe if America is to have a strong national defense capability. Senator Barry Goldwater states: "...we simply don't have the (industrial) capability any longer to surge military production the way we did in World War II. Much of the blame for this decline must be placed on the government itself."⁴⁰ I concur with Senator Goldwater. The federal government must accept its share of the responsibility in this area and be prepared to initiate constructive solutions.

I also conclude that a dangerous, three-part trend has overtaken America's defense industrial base. Reductions in the growth of industrial productivity and capital investment, coupled with severe increases in costs and the reduced number of suppliers of essential materiels, combined with an equally serious reduction in skilled labor equate to an almost untenable defense industrial condition. Senator Goldwater describes this phenomena as the "tragic trinity" which is devastating our industrial capacity.⁴¹

Recommendations

Now that the history and current state of America's industrial mobilization problems have been reviewed and updated, it is necessary to proceed with the difficult task of providing viable recommendations for

improvement. The ultimate solution may be difficult, if not entirely impossible, to achieve due to the complexity of America's industrial-economic society coupled with a national penchant for private profit. However, there are a number of initiatives which could be accomplished in the near and long-terms to facilitate the proper industrial response to the conventional war scenario with which I started this essay. What follows are changes recommended by Jacques Gansler, which I believe represent the best suggestions submitted to assist in solving a myriad of industrial problems:⁴²

1. Shift to Multiyear Funding of Procurement Contracts -- This recommendation would specifically assist 50,000 lower tier suppliers. They would benefit by being allowed to procure parts and equipment in advance without fear of losing the contract in succeeding years to either necessary or ill-advised budget reductions. Additionally, this offers the advantage of more efficient procurement rates and encourages needed capital investment in manufacturing hardware.

The Defense Science Board agrees this would be one of the most significant improvements enacted and estimates potential savings on multiyear contracting to be in the neighborhood of 10 - 15%. They also emphasize the indirect benefits in the event of a necessity to surge requirements.⁴³ It is comforting to note the current administration is amending certain provisions of the Defense Acquisition Regulation to allow multiyear procurements in instances such as the B-1B bomber and M-1 tank programs. Writing in the latest issue of "Defense 86," Secretary of Defense Weinberger notes vast improvements are forthcoming:

These accomplishments were made, in large part through wiser use of competition, multiyear procurement, economic production rates and stable procurement plans. The B-1B bomber and M-1 tank programs are two notable successes in this regard; so are our shipbuilding and

aircraft programs. The total number of annual competitive contracts has increased by 37% to more than six million since 1980. In 1985 nearly 72% of all contract actions, amounting to \$105 billion, were awarded competitively. Competition in shipbuilding increased from 26% in 1981 to approximately 90% at the end of 1985....savings from multiyear procurement and economic production rates are projected to be more than \$11 billion since 1982.⁴⁴

While the improvement in multiyear procurements has caused a change for the better, aggressive action is still required in order to realize America's full potential in this area.

2. Requirement for Multiyear Authorizations and Appropriations --

An obvious Department of Defense - Congress issue! The United States is the only major industrialized nation which does not provide long-term stability in the budget process. The question is debated every year in the legislative branch, and the concept appears essential to the long-term improvement of the defense industrial base. Many of the same benefits attributed to multiyear contracting apply equally to multiyear authorizations and appropriations. American industry should not be compelled to hold its collective breath from year-to-year in fear of arbitrary authorization and appropriation reductions.

3. Creation of Additional Incentives for Capital Investment --

Gansler submits, and the Defense Science Board concurs, that present federal government correction incentives (i.e., from taxes through profits) is aimed in the wrong direction. Specific legislative and regulatory steps need to be taken to provide greater financial incentives to private industry as a whole for capital investments in equipment and technology. These actions would go a long way toward solving US machine tool problems and encourage domestic investment rather than foreign purchases of parts and equipment. Logical

steps to improve capital investment include:

- Revisions of current depreciation allowances in order to make them more competitive with other industrialized nations;
- Investment tax incentives;
- Provisions for higher return on investments through allowance of higher profits; and,
- Increased government investment in manufacturing technology.

With respect to manufacturing technology, the current administration has shown it is not reluctant to forge ahead. Over the next ten years, US industry is expected to spend \$100 billion to automate manufacturing facilities.⁴⁵ This is another step in the right direction.

4. Require Multiple Sources for All Critical Parts -- A federal mandate for critical parts multiple sourcing will broaden the lower tier subcontractor base discussed previously. Added costs, if any, will most likely be absorbed through the introduction of additional competition. The Department of Defense is making active progress in this area, but has been tempered by the Congress. Numerous aircraft contracts and the M-1 tank engine are excellent examples of multiple sourcing and are further steps in the right direction.

5. Competition During Production on Large Defense Procurements -- Continuing competition through the production stage would be in contrast to the current practice of requiring competition solely for the initial contract. Gansler submits contractors presently have excellent "buy-in" opportunities under the existing regulations thereby setting the stage for raised prices during the remainder of their programs. My personal experience with M-1 tank spares supports Gansler's hypothesis. During the 1978-80 timeframe "buy-in"

was the rule rather than the exception for M-1 spare parts provisioning.

6. Broaden the Research and Development Base -- A critical area!

Every effort should be made by the Department of Defense to expand the R&D base to include the small, more innovative companies. This will necessitate a greater tolerance for administrative mistakes by the government, but should serve as an incentive for increased submissions of unsolicited proposals. New ideas should not be buried beneath a red tape blanket. As a bonus, expansion of the R&D base will improve capital investment.

7. Less Dependence on Foreign Sources -- The key to this recommendation is an emphasis on competition. Secretary Weinberger highlighted DoD advancements in competition during the previous discussion on multiyear procurements (page 22). This is not to suggest we should discontinue purchases of economically attractive goods from sources offshore, only that we should make our domestic base more competitive. Deregulation is the key to competitive success! Good examples are the federal government's deregulation of the airline industry and the break up of the AT&T monopoly. These deregulations resulted in lower airline fares and reduced costs for long distance phone calls. (Note that I did not suggest this resulted in lower local rates. Any reduction in local rates has certainly not been passed to the author.) Since deregulation in 1978, there are three times the number of airlines competing for the American traveler, with concurrent reductions in prices due to competition.⁴⁶

Competition is the driving force needed to reduce foreign dependence in the defense industrial sector. Once again, the US may be headed in the right direction. According to "Fortune" magazine, defense spending and the resultant competition accounts for 20% of the growth of America's electronics and machine tool industries. Further, orders from defense contractors are the most active

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segment of the machine tool business. The US must make a concerted effort to divest itself from foreign industrial defense dependence. Competition is the key!

8. Significant Structural Adjustments Are Required Within the Defense Industry -- The previous recommendations can all be generally categorized as short-term fixes. Structural adjustment of the defense industry represents a critical long-term solution. If America's defense industrial base is to realize success in the future, structural adjustment is imperative. As previously discussed, there is a basic structural imbalance within the defense industry, the correction of which is mandatory to win the next major conflict.

The federal government urgently needs to examine the possibilities inherent with a greater integration of civilian and military production. This would provide increased economic efficiencies and absorb the cyclic production problems which now exist within the industry. This is a radical change which requires extensive study, but could potentially have significant long-term benefits. I am not championing a socialist approach, whereby government controls the entire defense industrial sector, but I am suggesting that there may be methods available to more successfully integrate government and industry defense production. The United States cannot standby idly and construct only one new government defense production facility since 1965. Sweeping changes in the structure of our defense mobilization base are required to insure America is competitive with the Soviet Union.

SUMMARY

By design, this essay has developed a negative picture of America's defense industrial mobilization capability. This predisposition was reached

after extensive research and represents what I believe to be the actual state of our nation's ability to react to the conventional war scenario described at the beginning of this essay. In short, the United States would have a difficult, if not impossible, time reacting successfully to a conventional Soviet threat.

I wish I could dramatically announce America was at a crossroad with respect to its defense mobilization capability, but it is not. As outlined in the preceding narrative, America is well past the crossroad. The United States is headed for even more problems as it watches domestic competition decline, becomes more dependent on foreign manufacturing, and graduates fewer engineers and scientists. As stated in the aforementioned recommendations, the US has started in the right direction for improvement, and the capability to eventually adjust exists. However, only time will tell if America has begun soon enough and with enough resolve to overcome significant obstacles.

The United States would do well to heed Solon's stern warning to Croesus, the wealthy king of ancient Lydia, in considering the value of a country to arm itself with first-rate materiel: "Sir, if any man hath better iron than you, he will surely be the master of all this gold!" There's a moral there somewhere!

ENDNOTES

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3. Ibid., p. 22.
4. Jacques S. Gansler, "The Defense Industrial Base," in Industrial Capacity and Defense Planning, ed. by Lee D. Olvey, Henry A. Leonard and Bruce E. Arlinghaus, p. 107.
5. Jacques S. Gansler, The Defense Industry, pp. 9-11.
6. Reppy, p. 21.
7. Ibid., p. 22.
8. James M. Blair, Economic Concentration: Structure, Behavior and Public Policy, p. 380.
9. Jacques S. Gansler, "The Defense Industrial Base," in Industrial Capacity and Defense Planning, ed. by Lee D. Olvey, Henry A. Leonard and Bruce E. Arlinghaus, p. 105.
10. Soviet Military Power -1985, p. 10.
11. Casper W. Weinberger, "Assessing the Nation's Defense," Defense 86, March - April 1986, p. 16.
12. General James P. Mullins, USAF, "Integrating Military and Industrial Complex," in Vital Speeches of the Day, 15 October 1984, p. 9.
13. Soviet Military Power - 1985, p. 11.
14. Reppy, p. 24.
15. Soviet Military Power - 1985, p. 142.
16. US GAO, p. 1.
17. Reppy, p. 28.
18. Ibid., p. 26.

19. Ibid.
20. Jacques S. Gansler, "The Defense Industrial Base," in Industrial Capacity and Defense Planning, ed. by Lee D. Olvey, Henry A. Leonard and Bruce E. Arlinghaus, p. 106.
21. US GAO, pp. 1-2.
22. Ibid.
23. Loren Thompson, "The Defense Industrial Base: Going, Going...," in International Security Review #6, p. 237.
24. Robert C. Fabrie, "Structural Change in the US Industrial Base," in Mobilization and the National Defense, ed. by Hardy L. Merritt and Luther F. Carter, p. 100.
25. Ibid., p. 97.
26. Ibid., p. 96.
27. Defense Science Board, Study Panel on Industrial Responsiveness, p. 53.
28. Fabrie, p. 103.
29. Bruce R. Scott, "National Strategy for Stronger US Competitiveness," in Harvard Business Review, March - April 1984, p. 77.
30. Fabrie, p. 91.
31. Ibid.
32. Ibid., pp. 93-95.
33. Fabrie, p. 93.
34. Defense Science Board, p. xv.
35. Fabrie, p. 94.
36. Defense Science Board, p. 13.
37. Ibid., p. 9.
38. Senator Barry Goldwater, "US Dependency on Foreign Sources for Critical Material," in Vital Speeches of the Day, 15 June 1981, p. 519.
39. "Brave New Economy," US News and World Report, 31 March 1986, p. 44.
40. Goldwater, p. 519.

41. Ibid.

42. Jacques S. Gansler, "The Defense Industrial Base," in Industrial Capacity and Defense Planning, ed. by Lee D. Olvey, Henry A. Leonard and Bruce E. Arlinghaus, pp. 110-114.

43. Defense Science Board, p. 68.

44. Weinberger, pp. 19-20.

45. "Brave New Economy," p. 45.

46. Ibid., p. 44.

47. "The Military Boost to Industry," Fortune, 30 April 1984, p. 42.

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